

# The History of the Atom



*(And other Science stuff)*

*by J. Caterina*

*with*

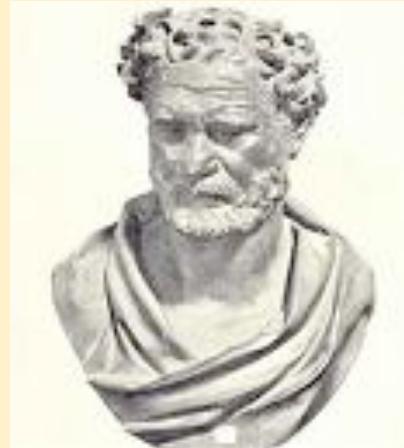
*technical assistance from*

*A. and C. Caterina*

# Ancient Greece

## □ Democritus

- @ 400 bce
- Greek philosopher
- First to propose concept that all things are made of "atoms"
- Problem: NO PROOF



# Ancient Greece

## □ Aristotle

- @ 350 bce
- Much more popular
- All things consist of.....



# Ancient Greece

☐ Earth

☐ Wind

☐ Fire

☐ Water



# Medieval Period

- ❑ Philosophy and ideas dominated by....
- ❑ RELIGION
- ❑ Alchemy (much knowledge gained)



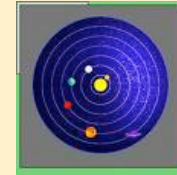
# Renaissance

- ❑ 14th to 16th Century
- ❑ Literature and Art Dominate
- ❑ Scientific advances begin
- ❑ Davinci



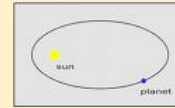
# “Rebirth of Science”

- 16th Century and 17th Century
- Astronomy and Physics
- Copernicus (heliocentric model)
- Brahe (supporter of Copernicus)
- Kepler (planetary



# Rebirth-cont'd

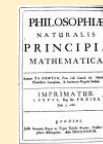
- Kepler (planetary orbits)



- Galileo (telescope, levers, pulleys, "gravity")



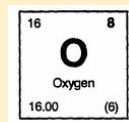
- Newton (calculus, Laws of Motion)





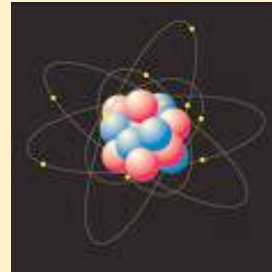
# Foundations of Modern Chemistry

- 18th century
- Cavendish (disc. hydrogen)
- Priestley (disc. oxygen/debunk "phlogiston" theory)
- Lavoissier (disc.  $\text{CO}_2$ )



# First Atomic Theory

- John Dalton, 1803
- used results from others (e.g. Priestley, Cavendish, etc....)
- All Elements are made of tiny indivisible "ATOMS"
- Atoms of the same element are "identical"



## Dalton-cont'd

- Atoms of different elements are fundamentally different from each other.

Sodium
11
Na
22.990



Chlorine
17
Cl
35.453



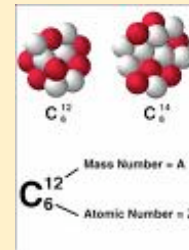
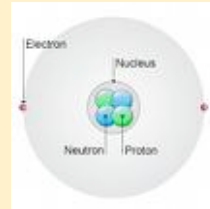
- Atoms can chemically combine in simple whole number ratios to form compounds. (video)

# Dalton-cont'd again

❑ PROBLEMS:

❑ "indivisible"  
(subatomic  
particles)

❑ "identical" (isotopes)



# 19th Century (mainly Bio)

- ❑ Lamarck @1820  
(acquired characteristics)
- ❑ Schleiden and Schwann @1830 (cell structure)
- ❑ Pasteur @1850  
(bacteria)



(Chemistry/Physics)

- Mendeleev @1870 (periodic table)
- Crookes @1880 (Cathode Ray Tube)
- Roentgen @1890 (XRay)
- Becquerel @1890 (Radioactivity of Uranium)
- Curie @1900 (radiation studies)

[illegible]

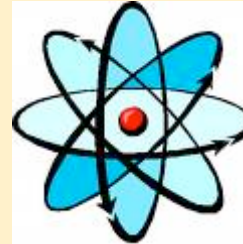
# Discovery of the Electron

- J.J. Thomson, 1897
- using a cathode ray tube (CRT)
- Observed beam seemed be moving neg to pos direction
- Beam was affected by magnet (video)



## Electron Cont'd

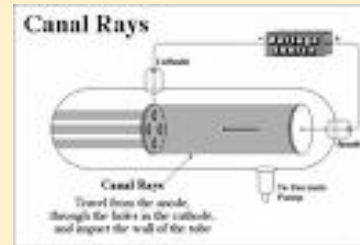
- Conclusions:
- "cathode rays" consisted of a fast moving stream of electrons.
- charge of electron is  $-1$
- mass of electron is  $1/1840$  amu (virtually mass-less)





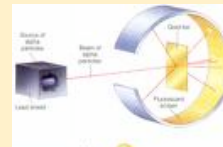
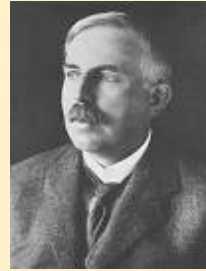
# Discovery of Proton

- Thomson et al. @ 1900
- used altered CRT
- Noticed new particles, called them "canal rays"
- Charge of proton = +1



# Discovery of Nucleus

- Ernest Rutherford, 1911
- Known as the "Gold Foil Experiment"
- (video)
- (Demo)



□ Conclusions:

□ the atom is mostly  
Empty Space

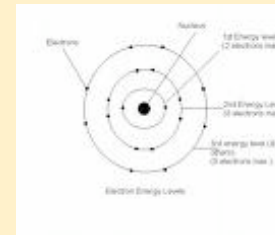


□ there must be a  
small, dense,  
positively charged  
"core" of the atom....  
the Nucleus.



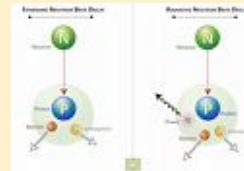
# Neils Bohr

- ❑ a graduate student working with Rutherford
- ❑ introduced the concept of electrons being organized into distinct Energy Levels
- ❑ Developed a popular model of the atom based on.....
- ❑ the solar system.



# Discovery of the Neutron

- suspected to exist since early 1900s....but
- ....no proof (why not???)
- Discovered by Chadwick in 1932 during radiation decay experiments.



- Charge of neutron equals...
- NO NET CHARGE
- Mass of neutron = 1 amu



# The Power of the Atom

- ❑ Manhattan Project, 1940s
- ❑ Included Bohr, Fermi, Chadwick, Oppenheimer
- ❑ First working nuclear weapon.
- ❑ video:



# THE END

- Powerpoint produced by J. Caterina
- Technical assistance by Alicia and Carmen Caterina (thank goodness for their help!)